REMARKS

By this response claims 1, 4, and 6 have been amended and claims 8 and 9 have been added. Claims 1-9 remain pending. Reconsideration of the application as amended is respectfully requested.

Rejections under 35 USC §112

The Examiner has rejected claims 1-5 and 7 as being vague and indefinite for the usage of the term "about." However, it has been established that the term "about" is neither vague nor indefinite (*BJ Servs. Co. v. Halliburton Energy Servs. Inc.*, 67 USPQ 2d 1692, Fed. Cir. 2003). It may be reasonably presumed that one of ordinary skill in the art would understand the method and conditions needed to measure the actual flow rates of the gasses, and could also determine whether the result of the flow rates produced the stated result, which includes a particular slope of a sidewall.

Additionally, claims 3, 5, 6, and 8 of the issued parent (6,722,376) comprises claims which use the term "about" relative to flow rates and top (TCP) power. As an issued patent is presumed valid, the language is clearly sufficient and succinct to one of ordinary skill in the art, and is allowable in light of the teaching of the specification. Allowance of this language in the claims of the parent case based on a specification having the same teachings with regard to flow rates and power would appear to be *prima facie* evidence that the language is sufficiently clear.

The amendment to claim 6 overcomes the redundancy between claims 3 and 6, and the lack of antecedent basis for "dielectric layer" of claim 7.

Thus it is submitted that the rejected claims are allowable under 35 USC §112.

Rejections under 35 USC §102(b)

Claims 1, 3, and 6 have been rejected under 35 USC §102(b) over Tseng (US 5,192,702). Referring to FIGS. 4 and 5 and the accompanying text at column 5 lines 23-45, Tseng recites a method for forming a polysilicon layer 32 having first and second cross sectional sidewalls. Tseng then covers the sidewalls with a mask layer 38 of silicon oxide, and etches the thickness 40 of the polysilicon layer 32 while the sidewalls of the polysilicon layer are protected from etching by the silicon oxide 38. The etch of the thickness (but not the sidewalls) of the polysilicon is performed using an etch comprising a 6 to 10 sccm flow of helium/oxygen. The silicon oxide layer 38 is removed after etching with thickness of the polysilicon.

The present invention as claimed comprises novel differences over the teaching of Tseng. For example, claim 1 recites the formation of a conductive layer comprising "first and second vertically-oriented cross sectional sidewalls...selecting a post-etch profile from first and second post-etch profiles, wherein the first post-etch profile results from an etch which removes the lower portion of each sidewall of the conductive layer at a faster rate than it removes the upper portion to result in a substantially U-shaped profile of the conductive layer; and the second post-etch profile

results from an etch which removes the lower portion of each sidewall of the conductive layer at a faster rate than it removes the upper portion to result in the conductive layer having a profile which tapers inward at a uniform rate from the upper sidewall portion to the lower sidewall portion; then etching the conductive layer using an etch comprising a flow rate of between about 9 sccm and about 12 sccm He-O_2 to result in the conductive layer having the selected post-etch profile...".

Tseng intentionally forms a masking silicon oxide layer 38 over the sidewalls of polysilicon 32 to prevent etching during the etch using helium/oxide, thus Tseng teaches away from the present invention as claimed. Further, Tseng does not disclose selecting a post-etch profile from the stated U-shaped and sloping profiles, nor etching using the stated etch to result in the stated profile. Thus Tseng as applied by the Examiner fails as a reference for at least these reasons.

Rejected claim 3 is allowable over Tseng at least because it depends from an allowable base claim, and the dependency of claim 6 has been corrected and depends from a base claim which was not rejected over Tseng.

Claims 1, 3, and 6 have been rejected over Yu (US 5,723,893). Yu discusses etching the polysilicon layers 20 and 24 of FIG. 1 using a mixture comprising a flow of 2 sccm He/O_2, and completed using an etch comprising 3-5 sccm He/O_2 and 100-150 sccm helium (column 5 lines 20-45). This forms the vertically-oriented sidewalls of layers 20 and 24 depicted in FIG. 2. Yu then forms the spacers 28 on the sidewalls.

The rejected claims comprise novel differences over the disclosure of Yu. For example, claim 1 recites forming first and second vertically-oriented sidewalls from the conductive layer, then etching the conductive layer using the stated etch to result in the conductive layer having the selected post-etch profile. The etch comprises between about 9 sccm and about 12 sccm He-O_2. Yu etches the conductive layers 20, 24 using an etch comprising helium and oxygen to form vertical sidewalls. The flow rate used by Yu, 3-5 sccm, is described in the present specification as forming vertical sidewalls (see ¶[0026]). Thus Yu does not disclose at least "selecting a post-etch profile from first and second post-etch profiles...to result in a substantially U-shaped profile [or a] profile which tapers inward at a uniform rate from the upper sidewall portion to the lower sidewall portion...[and] etching the conductive layer using an etch comprising a flow rate of between about 9 sccm and about 12 sccm He-O_2 to result in the conductive layer having the selected profile." Thus Yu fails as a reference under 35 USC §102(b) for at least these reasons.

Thus claim 1 as applied by the Examiner is allowable over Yu under 35 USC §102(b). Rejected claim 3 is allowable at least because it depends from an allowable base claim, and the dependency of claim 6 has been corrected and depends from a base claim which was not rejected over Yu.

Rejections under 35 USC §103(a)

Claims 1-3 and 6 have been rejected under 35 USC §103(a) over Tao, et al. (US 6,156,629). Referring to FIGS. 1-4 and the accompanying text, Tao recites a three step method comprising forming a polysilicon layer 18 then etching the polysilicon layer with an etch comprising a 0 to 20 sccm flow of 70% He and 30% O_2.

The present method as recited in rejected claims 1-3 and 6 comprises novel and nonobvious differences over the invention of Tao. Claim 1, for example, recites "forming a conductive layer...etching completely through the conductive layer to expose the semiconductor wafer substrate assembly on first and second sides of the conductive layer and to form first and second vertically oriented sidewalls...selecting a post-etch profile from first and second post-etch profiles, wherein the first post-etch profile results from an etch which removes the lower portion of each sidewall of the conductive layer at a faster rate than it removes the upper portion to result in a substantially U-shaped profile of the conductive layer; and the second post-etch profile results from an etch which removes the lower portion of each sidewall of the conductive layer at a faster rate than it removes the upper portion to result in the conductive layer having a profile which tapers inward at a uniform rate...; then etching the conductive layer...to result in the conductive layer having the selected post-etch profile...".

Tao forms the conductive layer 18 to have first and second vertical sidewalls as depicted in FIG. 4, but does not then etch the conductive layer "to result in a substantially U-shaped profile of the conductive layer" or "to result in the conductive layer having a profile which tapers inward at a uniform rate." As Tao does not teach or suggest every feature, claim 1 is allowable over Tao. Claims 2 and 3 are allowable at least because they depend from an allowable base claim. Claim 6 is allowable over Tao as the dependency has been amended to depend from a claim which is not rejected over Tao.

Claims 1-7 have been rejected under 35 USC §103(a) over Shen, et al. Shen describes a three step etch method which removes polysilicon over a gate oxide in an effort to minimize damage to the gate oxide. The first etch removes layers overlying the polysilicon layer 12, may partially etch the polysilicon layer 12 (FIG. 6 and column 5 lines 9-15), and comprises helium oxygen at a flow rate of from about 0 to 20 sccm. The second etch provides a high oxide to polysilicon selectivity, and removes the polysilicon 12 to expose the oxide with an etch comprising helium oxygen at a flow rate of between about 0 to 20 sccm. The third etch has a higher oxide to polysilicon selectivity, and removes polysilicon residues from the oxide layer 10 with an etch comprising helium oxygen at a flow rate of between about 0 and 10 sccm.

Shen (column 1 lines 11-30) discusses that sloped sidewalls in the polysilicon is to be avoided, because with sloped sidewalls the gate would not be thick enough to effectively mask the substrate against implantation, and would therefore produce devices whose channel length depends on the degree of sidewall taper.

The present claims comprise novel and nonobvious differences over Shen. Claim 1 recites "selecting a post-etch profile from first and second post-etch profiles, wherein the first post-etch profile results...in a substantially U-shaped profile of the conductive layer and the second post-etch profile results...in the conductive layer having a profile which tapers inward at a uniform rate from the upper sidewall portion to the lower sidewall portion; then etching...to result in the conductive layer having the selected post-etch profile." Claim 4 recites a similar method.

As discussed above, Shen at column 1 lines 11-30 teaches away from the formation of the claimed method which intentionally forms either a U-shaped profile or a tapered profile. Assuming the helium oxygen flow rates would, in combination with the other etch parameters discussed by Shen, allow for a tapered, U-shaped, or vertical profile, experimentation using the process described by Shen would result in a vertical profile because this is what Shen is attempting to form, and discusses reasons why the claimed profile is to be avoided. Thus claims 1 and 4, and rejected claims 2, 3, and 5-7 which depend therefrom, are allowable over Shen, et al. under 35 USC §103(a).

Claim 2 has been rejected under 35 USC §103(a) over Yu, which discusses etching the polysilicon layers 20 and 24 of FIG. 1 using a mixture comprising a flow of 2 sccm He/O_2, and completed using an etch comprising 3-5 sccm He/O_2 and 100-150 sccm helium (column 5 lines 20-45). This forms the vertically-oriented sidewalls of layers 20 and 24 depicted in FIG. 2. Yu then forms the spacers 28 on the sidewalls.

It is submitted that rejected claim 2 is allowable over Yu. Claim 1 from which claim 2 depends recites forming first and second vertically-oriented sidewalls from the conductive layer, then etching the conductive layer using the stated etch to result in the conductive layer having the selected post-etch profile. The etch comprises between about 9 sccm and about 12 sccm $He\text{-}O_2$. Yu etches the conductive layers 20, 24 using an etch comprising helium and oxygen to form vertical sidewalls. The flow rate used by Yu, 3-5 sccm, is described in the present specification as forming vertical sidewalls (see ¶[0026]). Thus Yu does not disclose at least "selecting a post-etch profile from first and second post-etch profiles...to result in a substantially U-shaped profile [or a] profile which tapers inward at a uniform rate from the upper sidewall portion to the lower sidewall portion...[and] etching the conductive layer using an etch comprising a flow rate of between about 9 sccm and about 12 sccm $He\text{-}O_2$ to result in the conductive layer having the selected profile."

Because Yu is attempting to form vertical sidewalls and states a specific flow rate of $He\text{-}O_2$ which is described in the present specification as forming vertical sidewalls, there is no need for Yu to experiment outside the stated range to result in the parameter values recited in present claim 2. Yu's goal is accomplished by the flow rates stated. Because Yu fails to teach or suggest the elements of claim 1 from which claim 2 depends, and there is no motivation for Yu to experiment beyond the values stated by Yu to result in the claim 2 values, Yu fails as a reference under 35 USC §103(a) over claim 2 for at least these reasons.

Conclusion

If there are any matters which may be resolved or clarified through a telephone call, the Examiner is cordially invited to contact the undersigned. This is believed to be a complete response to the Examiner's office action.

Respectfully submitted,

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